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On the whole this series is indispensable to every working laboratory. The plates are luminous, and make it possible for the eye-minded to learn at a glance what they might fail to gain so well by reading pages of descriptions. C. F. H.

*The Function of the Frontal Lobes.* L. BIANCHI. Brain, LXXII, pp. 497-522, 5 Figs. London, 1895.

Hitzig's shrewd observation that the frontal lobe increased proportionally to the rest of the brain as we ascend the scale of intelligence from cat, dog, monkey to man, leads naturally to the inference that this is the centre for intellectual functions.

His experiments on dogs, however, did not yield much support to this view. Still, from the absence of any demonstrable sensori-motor functions, the function of intelligence was almost forced upon the pre-frontal region by exclusion. The work of Ferrier, too, strengthened this position, since he found in monkeys loss of attention, apathy, etc., resulting from ablation of the pre-frontal lobes. On the other hand a definite function has been found for this region by Munk, Luciani, and recently by Groslik, in furnishing innervation to the muscles of the trunk.

Bianchi operated on twelve monkeys and six dogs, all successfully, and describes in this paper the results of excision of both pre-frontal lobes in one dog and three monkeys. Unilateral ablation produced no observable defect, either sensory or motor, lasting for more than a few days. Previous observers have gone astray, mainly from the fact that they have attached too much importance to the phenomena of irritation immediately following the operation. Bianchi states that these should be systematically disregarded for at least a week.

Passing briefly in review the chief results, we may observe that in the dog we find all motor and sensory functions normal, but his character is changed. "He goes about with eyes downcast, and head bent down, almost touching the floor with his nose." "Hovers about heavily and aimlessly." He picks up everything he finds, leaves, sticks, filth, in his mouth and drops them again. He becomes very timid and makes no attempt at defense. "Frightened, it doubles itself up without any attempt to escape from the attack."

The monkey gives similar, but even more striking results. Previous to the operation she has been taught a number of tricks, understands language without gestures, is very affectionate, as shown by her treatment of her companions, and especially her attachment to two puppies which she has adopted and mothers. She will not allow them to be taken away from her.

Considerable weakness results from ablation of the left frontal lobe (3½ g. being removed), especially marked in the right arm and right eye. She is still intelligent, takes an interest in her surroundings. She now cares for one puppy with her left arm and avoids the second. About eighty days after first operation, the right pre-frontal lobe was similarly excised. Marked and permanent results follow. Taste is so much impaired that she takes, chews and swallows bits of sugar and plaster indifferently and automatically. A normal monkey rejects with evident disgust a cherry which has been filled with quinine, while after ablation of the frontal lobes, she eats it, but with some hesitation. Vision remains considerably impaired. Psychically "the habitual state is one of indifference; and she speedily relapses (after being aroused) into an aimless automatic mode of life, without any in-

terest in her surroundings." She ceases to play with companions, and shows neither affection nor jealousy when they are petted, but is timid and frightened without cause. Automatic restlessness, with tendency to rotation toward the right, also persists.

The general picture resembles quite closely that obtained by Ferrier, and leads Bianchi to the conclusion that the chains of nerve elements from sensory or motor terminations lead up to the nerve cells of the pre-frontal region as the apex of the personality. "The frontal lobes would thus sum up into a series the products of the sensori-motor regions, as well as the emotive states which accompany all perceptions, the fusion of which constitutes what has been called the psychical tone of the individual. Removal of the frontal lobes does not so much interfere with the perceptions taken singly as it does disaggregate the personality, and incapacitate for serializing groups of representations." "Fear is an immediate result of psychical disaggregation from defective sense of personality, and unbalanced perception and judgment." Thus it becomes a characteristic phenomenon.

If so simple an observation as the transit of a star across the spider line needs correction for "personal equation," what shall we say of observations as complicated as the above, extending over days, weeks and months? At best we can place these observations beside those of Groslik, and making due allowance for personal equations of insoluble terms of complexity, they may both be true to the facts and still leave many more facts unobserved and unrecorded.

It must be remembered also that Schæfer and Horsley obtained results diametrically opposed to those of Ferrier and Bianchi. Their method consisted in making the excision of the pre-frontal lobes, leaving the excised portions *in situ* and thus escaping pressure changes in the skull. Their trick monkeys were as active and intelligent after as before the operation, and their method of operation, it would seem, has much in its favor.

C. F. H.

*Defective Development of the Cerebellum of a Puppy.* J. S. RISIEN RUSSELL. Brain, LXXII, pp. 522-30, 5 Figs. London, 1895.

An entire litter of puppies from normal parents show such marked symptoms of incoördination and instability as to point to congenital defect of the cerebellum. One of the litter comes on this account into Dr. Russell's hands, and he is enabled to add to his important contributions to cerebellar anatomy and physiology. In walking, this puppy would fall in every direction equally, and when sitting or standing there was almost constant oscillation of the head and trunk. These phenomena indicated bilateral defect of the cerebellum, a diagnosis amply borne out by the autopsy findings. The cerebellum was found to be about three-fourths the normal size, and symmetrical. Section showed a peculiar condition of the white and gray matter, the molecular layer of the cortex being in many parts much thinner than normal, giving the folia a shrunken appearance, while in a few places it was three or four times its normal thickness. The great defect, however, was found in the Purkinje cells. In large parts of the cerebellum these cells were completely absent, in others one or two were to be seen here and there, while in a few places irregular groups or clusters of these cells were to be seen, the outer margin of the cluster being at the junction of the granular and molecular layers, while the cells invaded the granular layer to a considerable extent.